

# Modern Concepts of Cardiovascular Disease

Published monthly by the AMERICAN HEART ASSOCIATION

50 WEST 50TH STREET, NEW YORK, N. Y.

DR. SAMUEL A. LEVINE, Boston, *Editor*

DR. MARSHALL N. FULTON, Boston, *Associate Editor*

Vol. IV

June, 1935

No. 6

## THE ELECTROCARDIOGRAPHIC DIAGNOSIS OF CARDIAC INFARCTION

### PART II

The anterior and the posterior types of infarction are the most frequently encountered. The electrocardiogram in each is highly reliable as a diagnostic aid. In addition to these two varieties, however, there are several other less common ones.

(C) There are some cases in which the RS-T interval deviations resemble those of posterior infarction, but in which a deep Q-3 wave is not seen. In this type the RS-T interval is apt to be elevated in lead IV more often than in lead III. The indications suggest that this lesion is located on the posterior, or posterolateral surface of the left ventricle, and does not involve the ventricular septum.

(D) Certain cases seem to show a combination of the signs of acute anterior infarction with those of acute posterior infarction. The one or the other usually predominates. In this group, one is apt to find acute infarction of both the anterior and the posterior walls of the left ventricle. This group should not be confused with those cases which have a healed lesion in one wall of the left ventricle and an acute lesion in the other. The latter may show the significant QRS complex phenomena of both, but the RS-T interval changes are characteristic of the recent lesion only.

(E) Some cases of coronary occlusion develop bundle branch block. When this occurs, the electrocardiographic signs of coronary occlusion are obscured. In such cases subsequent tracings may be helpful. The bundle branch block may disappear, leaving the typical electrocardiographic signs of acute myocardial infarction. We know of no criteria, as yet, by which to differentiate bundle branch block superimposed on acute myocardial infarction from bundle branch block without it.

There are very few cases that do not conform to any of these types. When the electrocardiogram fails to show one or the other of these patterns at some time during the acute stage, other diagnoses must be seriously considered.

Arrhythmias of all sorts may appear in cases of acute myocardial infarction; extrasystoles are com-

mon, auricular fibrillation and paroxysmal tachycardia (auricular and ventricular) may occur. The one type of disturbed mechanism which seems to be related to a particular variety of cardiac infarction is auriculoventricular block. This is seen almost exclusively in posterior lesions which show the electrocardiographic signs described above under group B.

The differential diagnosis of acute cardiac infarction from the electrocardiographic standpoint is sometimes difficult. RS-T interval deviations may be caused by digitalis administration; they have also been seen in certain cases of acute rheumatic carditis, acute pericarditis, hyperparathyroidism, bundle branch block, marked hypertension, congestive heart failure and dissecting aneurysm of the aorta; they may appear temporarily during attacks of angina pectoris. Changes in the ventricular complex from day to day are highly characteristic when they follow a certain recognized course. However, one must be sure that they have not been produced by digitalis medication, acute infection, change in position of the patient, or exercise. None of the electrocardiographic signs of acute cardiac infarction, when considered alone, is pathognomonic. However, when they occur grouped together, in certain characteristic patterns described above, they furnish extremely reliable diagnostic information, concerning both recent and healed infarction. In our experience, no other condition has produced the complete typical electrocardiographic picture of either of the two common types of acute cardiac infarction, unless the patient has had a previous coronary occlusion. It is helpful to remember one other fact in this connection: with few exceptions, those conditions which simulate coronary occlusion electrocardiographically, are not those which are readily confused with it on clinical grounds. Hence, a combination of clinical and electrocardiographic observations will usually lead to the correct diagnosis.

Let us now dismiss the electrocardiographic de-

### SCIENTIFIC SESSION

The Eleventh Scientific Session of the American Heart Association will be held at Hotel Claridge, Atlantic City, on Tuesday, June 11, 1935. The meeting is open to all interested persons.

Visit our Scientific Exhibit in Atlantic City Auditorium, June 10-14!

tails and consider two more general questions: (1) the purposes served by electrocardiography in the study and management of cases in which acute coronary occlusion is suspected or proved, and (2) the way in which it can be used to greatest advantage in these cases. These questions will be discussed together under the headings of A. Diagnosis, B. Prognosis, and C. Management.

**A. Diagnosis:** There are many patients who have attacks of pain suggesting coronary occlusion in which the diagnosis cannot be established without electrocardiographic assistance. The great majority of them will show electrocardiographic evidence of infarction, if infarction has taken place. The absence of these signs is helpful in ruling out infarction. If the phenomena of either the typical anterior or the typical posterior lesion are present, one need rarely hesitate in making the diagnosis. If the signs are suggestive, but neither of these characteristic patterns appears, one must be more cautious and watch the patient for further clinical and electrocardiographic confirmation. If no evidences of cardiac infarction appear in any of the four leads, particularly when the attack has been severe and prostrating, the diagnosis of coronary occlusion is usually wrong. If the attack has been less prostrating, i.e., if the clinical evidence suggests that the infarction may be small, and no electrocardiographic signs appear, one must weigh the diagnostic evidence and repeat the electrocardiographic studies daily. If at the end of a week no changes have appeared in the tracing, the diagnosis of an infarction of any size can probably be dismissed. The patient has had either (a) no coronary occlusion, (b) coronary occlusion without infarction, or (c) an infarction so small that it probably will not be immediately dangerous to life. The management of such a case must depend on factors which are clinical rather than electrocardiographic. Sometimes other chest leads in addition to lead IV may be helpful in the diagnosis of cases with doubtful electrocardiographic signs. However, an adequate control series is necessary before one can evaluate such tracings.

**B. Prognosis:** The electrocardiographic method can sometimes give considerable prognostic information in cases of coronary occlusion. When the typical signs of an anterior infarction appear the prognosis is considerably more grave than in the case of posterior infarction. The mortality is twice as great, and recovery of adequate cardiac power much less likely. Patients with the typical evidences of anterior infarction rarely acquire sufficient cardiac reserve to enable them to live a life requiring any degree of physical activity. On the other hand, a certain proportion of patients with posterior infarction are able to resume their former occupations after adequate convalescence. Our cases with huge T waves without RS-T interval deviations, have had a relatively benign immediate prognosis. Not enough cases of the other types have been studied to warrant general prognostic statements.

**C. Management:** The question arises as to whether one can judge from electrocardiographic study, how long to keep a patient in bed. Electrocardiography may help in making this decision, but is not the deciding factor in most cases. It fur-

nishes no information regarding the firmness of the scar, nor the presence or absence of mural thrombi. Moreover, the disappearance of the electrocardiographic phenomena of acute infarction does not necessarily indicate that it is safe for the patient to leave his bed. These signs disappear, as a rule, some time before the lesion heals, and all cases must be managed with this in mind. Certain features, however, elicited by electrocardiographic study are helpful. (1) If the lesion is a typical anterior infarct, according to the electrocardiographic criteria, the patient will usually require at least two months in bed and a long slow subsequent convalescence. On the other hand, posterior lesions usually require a shorter period of bed rest and a less protracted convalescence. (2) If the electrocardiogram continues to change over a period of three weeks before it becomes relatively constant in appearance, the patient will probably require a longer convalescence than when the tracing stops changing earlier in the course. Certainly, the patient should not leave the bed until several weeks after the electrocardiogram has lost the signs of acute infarction and has reached a more or less fixed state. (3) As long as unusually large T waves are present (especially upright T waves in lead IV 13 mm. or more in height) we believe that the lesion has not healed sufficiently to make it safe for the patient to get out of bed.

In conclusion, one might say that the diagnosis of acute cardiac infarction depends mainly upon three general groups of phenomena: (1) Pain over the heart or in those regions where anginal pains may radiate (epigastrium, shoulders, arms, throat and back—especially in the left scapular region, or in the midline above the fifth dorsal vertebra). The pain is almost invariably followed by a period during which the patient feels more or less prostrated and sick; often with fever; sometimes with leucocytosis; and usually with some reduction of blood pressure. The blood pressure may not begin to fall until a number of hours after the onset. (2) Electrocardiographic signs. (3) Certain other phenomena: cardiac arrhythmia, signs of congestive failure, pericardiac friction rub, embolic manifestations, distant heart sounds, gallop rhythm, and murmurs which are often transient. The relative importance of these three general groups of phenomena in diagnosis follows the order given above. The first two are, however, much more important than the third. None of them should be considered essential to the diagnosis. None should be considered absolutely pathognomonic of the lesion. The diagnosis is to be made by a careful evaluation of them all.

In this brief discussion, it has not been possible to give credit to the many investigators who have contributed to our knowledge of this subject. Among those whose investigations have been most important in connection with the present discussion are Herrick, F. M. Smith, Pardee, Parkinson and Bedford, Levine, Barnes and Whitten, and F. N. Wilson. All statements, however, represent the views of the authors based on their own studies.

CHARLES C. WOLFERTH, M.D., and  
FRANCIS C. WOOD, M.D.,

Philadelphia, Pa.

